

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

15CV71

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Municipal and Industrial Wastewater Engineering

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Any missing data can be assumed.*

### Module-1

- 1 a. Define Dry Weather Flow. Explain the factors influencing DWF. (05 Marks)  
b. Differentiate between conservancy system and water carriage system. (05 Marks)  
c. Calculate the quantity of sewage for separate and partially separate system for a town given the following data:  
i) Area of the town – 250 hectares  
ii) Intensity of rain fall – 50mm/hr  
iii) Population density – 300 person/hectare  
iv) Rate of supply – 250/pcd  
v) Peak factor – 2.0  
vi) Surface classification

Type of surface	Y Area	Run off coefficient
Roofs	50%	0.9
Paved surface	20%	0.85
Non paved surface	30%	0.30

Assume 80% of the water supplied reaches the sewer. (06 Marks)

### OR

- 2 a. Explain the desirable characteristics of a sewer material. (05 Marks)  
b. Write a note on ventilation of sewers. (05 Marks)  
c. Develop a relationship between a diameter of the circular section of a sewer and a side of the rectangular sewer section having width as twice its depth the three sides are wetted. (06 Marks)

### Module-2

- 3 a. Explain self purification phenomenon with a neat sketch of oxygen sag curve. (05 Marks)  
b. Explain self cleaning velocity and non sourcing velocity. (05 Marks)  
c. Design a sewer to a population of 60,000 the rate of water supply is 135/pcd. The slope available for the sewer to be laid is 1 in 625 and the sewer should be designed to carry four times the DWF when running full. What would be the velocity of flow? Take  $N = 0.012$ . (06 Marks)

### OR

- 4 a. Explain: i) Sewage farming ii) Sewage sickness. (08 Marks)  
b. Explain the methods of sewage disposal i) By dilution ii) By land treatment. (08 Marks)

**Module-3**

- 5 a. Derive an expression for first stage BOD with usual notations. (06 Marks)  
b. Define the terms BOD and COD. (04 Marks)  
c. The 5 day BOD @ 20°C of a sewage sample was found to be 100mg/l. Calculate 2 day BOD at 30°C for the same sample,  $K_{20} = 0.1/\text{day}$ . (06 Marks)

OR

- 6 a. Write a detailed flow diagram of a sewage treatment plant for a large city. Indicate the components. (06 Marks)  
b. With a neat sketch, explain working principle of activated sludge process. (06 Marks)  
c. Mention the operational problems of trickling filter process. (04 Marks)

**Module-4**

- 7 a. Discuss in detail the impact of industrial wastewater on water bodies. (08 Marks)  
b. Briefly explain strength reduction strategy for an industrial effluent concerned with waste treatment. (08 Marks)

OR

- 8 a. List the techniques applied in removal of suspended solids. Explain any two methods. (08 Marks)  
b. Briefly explain the circumstances under which joint treatment of domestic wastewater and industrial wastewater is recommended. (08 Marks)

**Module-5**

- 9 Explain briefly the characteristics and treatment of cane sugar mill effluent with the aid of a flow chart. (16 Marks)

OR

- 10 a. Explain the sources and characteristics of tannery wastewater with the help of flow diagram. (10 Marks)  
b. Explain in brief the effect of dairy waste in receiving streams. Also propose a treatment for dairy wastewater. (06 Marks)

\*\*\*\*\*

# CBGS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

15CV72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021

## Design of RCC and Steel Structures

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS456-2000 and SP16, IS800, -steel tables is permitted.

### Module-1

- 1 Design RCC rectangular combined footings for two columns which are 3.6m apart carrying a load of 1000kN and 1500kN. Sizes of column are 400mm × 400mm and 600 × 600mm. Width of footing is 1.8m SBC of soil is 280 kN/m<sup>2</sup>. M20 concrete and Fe415 steel is used. Assume beam and slab type combined footing sketch the details of Reinforcement. (40 Marks)

OR

- 2 RCC hall 10m wide 20m long is provided with portal frame 4m c/c. Frame are fixed at bottom. Heights of columns are 16.5m. Live load = 1.5 kN/m<sup>2</sup> SBC = 120 kN/m<sup>2</sup>. Design the slabs, portal Frame, column and footing using M20 concrete and Fe 415 steel. Sketch details of reinforcement. (40 Marks)

### Module-2

- 3 Design a plate girder for an effective span 14m. Load on the girder consist of UDL 45 kN/m in addition to two point loads each of magnitude 400kN placed at a distance of 3m, on either side of mid span point of girder, Design Mid span cross section curtailment of flange, Intermediate stiffness and end bearing stiffness. Draw sketch showing detail of longitudinal section cross section at mid span and support and plan of girder. (40 Marks)

OR

- 4 Design a gantry girder for a span 25m column spacing = 8m, Wheel base = 3.5m, Crane capacity = 200kN, Weight of crane bridge = 150 kN, Weight of trolley crab = 75kN, Min hook distance = 1m, Weight of rail = 0.3 kN/m, height of rail = 105mm. Draw suitable sketch showing details of cross section, Longitudinal section and plan. (40 Marks)

\* \* \* \* \*

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

15CV73

## Seventh Semester B.E. Degree Examination, Jan./Feb.2021 Hydrology and Irrigation Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. Explain Global and India water availability. (07 Marks)  
b. Explain with neat sketch an engineering representation of hydrologic cycle. (09 Marks)

OR

- 2 a. What is precipitation? Explain different forms of precipitation. (09 Marks)  
b. The average rainfall of 5 rain gauges in the base stations are 890, 540, 450, 410 and 550 mm. If the error in the estimation of rain fall should not exceed 10%, how many additional gauges may be required? (07 Marks)

### Module-2

- 3 a. List the factors affecting evaporation. (05 Marks)  
b. Describe the ISI standard evaporation pan with a neat sketch. (07 Marks)  
c. What is the evaporation, if 4.75 litres of water is removed from an evaporation pan of diameter 1.22 m and the simultaneous rainfall measurement is 8.8 mm? (04 Marks)

OR

- 4 a. Describe how infiltration capacity rate can be measured using a double ring infiltrometer. (08 Marks)  
b. Define  $\phi$ -index and W-index. (04 Marks)  
c. In the month of November for a particular place, monthly percentage of hours of bright sunshine is 7.2 and mean temperatures is 18°C. If the consumptive use coefficient of crop is 0.7 for that month, find the consumptive use or evapotranspiration of the crop in mm/day by Balney-Criddle method. (04 Marks)

### Module-3

- 5 a. What is runoff? Discuss the factors affecting the runoff. (10 Marks)  
b. Explain with sketches different shapes of catchment. (06 Marks)

OR

- 6 a. What are the components of hydrographs? Explain how base flow is separated from a hydrograph. (06 Marks)  
b. What is unit hydrograph? What are the assumptions made in derivation of UH theory. (04 Marks)  
c. What are the uses and applications of unit hydrograph? (06 Marks)

### Module-4

- 7 a. What is irrigation? What are the advantages and disadvantages of irrigation? (08 Marks)  
b. Explain Bandhara Irrigation with a sketch. Give briefly the advantages and disadvantages of bandhara Irrigation. (08 Marks)

OR

- 8 a. Explain the terms duty, delta and base period. Derive a relationship between the two for a given base period. (08 Marks)
- b. If the depth of water stored at 5 points in a field are 1.0, 0.9, 0.8, 0.7 and 0.6 m. Determine the water distribution efficiency. (04 Marks)
- c. (i) Find the delta of crop if the duty is 1800 ha/cumec and the base period is 130 days.  
(ii) What would be the duty if the delta is increased by 20% and the base period reduced by 10 days? (04 Marks)

Module-5

- 9 a. What is Canal? What are the different types of canals? (06 Marks)
- b. Explain with a sketch Ridge canal or water shed alignment of canals. (06 Marks)
- c. Define the following terms:  
(i) Gross command area.  
(ii) Cultural command area.  
(iii) Any two difference between lined and unlined canals. (04 Marks)

OR

- 10 a. The slope of the channel in aluminum is  $\frac{1}{4000}$ , Lacey's silt factor is 0.9 and side slope are  $\frac{1}{2}(H):1(V)$ . Find the channel section and maximum discharge which can be allowed to flow in it. (08 Marks)
- b. Briefly explain :  
(i) Investigation for reservoir site.  
(ii) Economic height of a dam. (08 Marks)

\*\*\*\*\*

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

15CV741

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021

## Design of Bridges

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IRC-6, IRC-21, IRC-112, IS458-1988 is permitted.  
3. Missing data may be assumed suitably.*

### Module-1

- 1 a. Briefly explain the following term related to bridge engineering atleast with one relevant formula for each.  
(i) Afflux (ii) Scour (06 Marks)  
b. Derive the condition of Economic Span of bridge. (10 Marks)

OR

- 2 a. What is impact factor, briefly explain the impact allowances in IRC class A loading. (06 Marks)  
b. Determine the waterway for the bridge across a stream with flood discharge of  $225 \text{ m}^3/\text{s}$ , velocity  $1.5 \text{ m/s}$  and width of flow at high level in  $60\text{m}$ , the allowable velocity under the bridge is  $1.8 \text{ m/s}$ . (10 Marks)

### Module-2

- 3 Design a reinforced concrete slab culvert for national highway over a stream crosses a road at an angle of  $90^\circ$ . The design datas are as follows:  
Carriage way (two lane) =  $7.5 \text{ m}$   
Footpath =  $1\text{m}$  on Either side  
Clear span =  $6\text{m}$   
Wearing coat =  $80\text{mm}$   
Width of bearing =  $400\text{mm}$   
Material :  $M_{25}$  grade concrete and Fe-415, HYSD Bars  
Loading : IRC class AA tracked vehicle. (16 Marks)

OR

- 4 Design the Skew slab culvert to suit the following data:  
Clear span =  $6 \text{ m}$ , Skew angle =  $10^\circ$ , Width of carriage way = (Two lane) =  $7.5 \text{ m}$   
Wearing coat =  $80 \text{ mm}$ , Width of bearing =  $400\text{mm}$ .  
Material :  $M_{25}$  grade concrete, Fe 415 HYSD Bars  
Loading : IRC class AA tracked vehicle. (16 Marks)

### Module-3

- 5 Design the cantilever slab of 'T' beam bridge for the following data:  
Width of road way =  $7.5\text{m}$   
Width of kerb =  $0.6\text{m}$   
Depth of kerb =  $0.3\text{m}$   
No. of longitudinal girder = 3  
Spacing of longitudinal girder =  $2.5\text{m}$   
Thickness of wearing coat =  $80\text{mm}$   
Type of loading : IRC class A wheel load  
Materials :  $M_{20}$  grade concrete, Fe-415 HYSD Bars. (16 Marks)

OR

- 6 Design the longitudinal girder of the 'T' beam bridge for following data by using Courbon's method for reaction factor:  
 Number of longitudinal girder = 3  
 Spacing of longitudinal girder = 3 m  
 Spacing of cross girders = 3.5m  
 Loading from cantilever portion from two sides = 31.32 kN.  
 Loading from deck = 41.32 kN  
 Span of the bridge = 14 m  
 Material : M<sub>40</sub> grade concrete, Fe 415 Steel  
 Loading : IRC class AA tracked vehicle. (16 Marks)

**Module-4**

- 7 Design a box culvert having inside dimension of 3m × 3m. This culvert is subjected to a dead load of 14000 N/m<sup>2</sup> and live load of IRC-class AA tracked vehicle. Assume the unit weight of the soil to be 18000 N/m<sup>3</sup>, the angle of repose of the soil is 30°C. The culvert is to be designed for particular case when dead load and live load acting from outside while no water pressure inside. The width of road is 7.5m and span is 3.3m. Use M<sub>25</sub> grade concrete and Fe-415 HYSD Bars. (16 Marks)

OR

- 8 Design a pipe culvert through a road embankment of height 6m. The width of road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5 m<sup>3</sup>/s. The safe velocity is 3 m/s. Assume bellmouth entry. Consider loading as IRC-class AA tracked vehicle. Given  $C_e = 1.5$ ,  $C_s = 0.010$  and unit weight of soil is 20 kN/m<sup>3</sup>. (16 Marks)

**Module-5**

- 9 A stone masonry abutment used for highway bridge having bottom width of 2 m and top width of 1m. The height of the abutment is 3m. The vertical load is 15 kN, the live load and dead load being 20 kN acting at 1/3<sup>rd</sup> of the height from the base. SBC of soil is 150 kN/m<sup>2</sup>. Coefficient of friction in 0.5, the density of stone masonry in 25 kN/m<sup>3</sup>. Compute the stress developed at the base and check the stability of the abutment. (16 Marks)

OR

- 10 a. List the types of Expansion bearing. Briefly explain any one with neat sketch. (08 Marks)  
 b. List the types of expansion joints used in bridges and briefly explain any one with neat sketch. (08 Marks)

\*\*\*\*\*

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

15CV751

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Urban Transportation and Planning

Time: 3 hrs.

Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Missing data, if any, may be suitably assumed.

### Module-1

- 1 a. Explain Briefly, the need and role of metro rail transportation with its relative advantages. (08 Marks)  
b. List the various urban traffic and transport problems in India. (08 Marks)

OR

- 2 a. Compare the mass, public and private transport systems, in detail. (08 Marks)  
b. Explain briefly, the various stages involved in urban transport planning process. (08 Marks)

### Module-2

- 3 a. Define zone. Mention the different factors considered in dividing the whole area into zones. (08 Marks)  
b. List various surveys required to collect data in urban transport planning and explain home interview survey, in detail. (08 Marks)

OR

- 4 a. Briefly explain, the expansion of data from samples and expansion factors used in urban transport planning. (06 Marks)  
b. Explain with sketch, various basic movements in transportation survey. (05 Marks)  
c. Explain four important factors considered while selecting external cordon line. (05 Marks)

### Module-3

- 5 a. Explain the various factors governing trip generation and trip attraction. (06 Marks)  
b. List the various assumptions considered in category analysis. (05 Marks)  
c. Explain multiple linear regression analysis. (05 Marks)

OR

- 6 a. Briefly explain Furness method, with its advantages and disadvantages. (06 Marks)  
b. The table below gives data for vehicle trips/day, income and persons in a household for one of the study area. Develop the trip generation equations between income and household persons. Indicate which one is more reliable and why?

Income (lakhs/year)	5	10	15	20	25	30
Persons/ household	4	6	8	9	8	6
Trips/day	5	6	8	4	4	6

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



**Module-4**

- 7 a. Explain the various factors governing modal split. (06 Marks)  
 b. A self contained town consists of four residential areas A, B, C and D and two intermediate estates X and Y. Generation equations shows that, for the design year (proposed), the trips from home to work generated by each residential area per 24 hour as follows :  
 A – 1000, B – 2250, C – 1750, D – 3200. There are 3700 jobs in industrial estate X and 4,500 in industrial estate Y. Attractions between zones are inversely proportional to square of journey times between zones. The journey times in minutes from home to work are :

Zones	X	Y
A	15	20
B	15	10
C	10	10
D	15	20

Table Q7(b)

Calculate and tabulate the inter zonal trips for journey from home to work. (10 Marks)

OR

- 8 a. With the help of flow diagram explain the modal split carried out after trip distribution. (08 Marks)  
 b. A market segment contains 600 individuals. A multinomial logit mode choice model is calibrated, resulting the following utility function  $u = a_k - 0.3 C - 0.02T$  where  $c$  = out of pocket cost in rupees,  $T$  – travel time in minutes,  $a_k$  – mode specific constant. The attributes, specific to each mode is given in the Table Q8(b). Predict the number of trips by each mode for this market segment.

Mode	$a_k$	C(Rs)	T(min)
Bus	0	1.00	30
Rail	0.40	1.50	20
Auto	2.00	2.50	15

Table Q8(b)

(08 Marks)

**Module-5**

- 9 a. Explain in detail, various diversion curves used in trip assignment technique. (08 Marks)  
 b. What is the purpose of trip assignment? Explain the minimum path tree method, in trip assignment technique. (08 Marks)

OR

- 10 a. With a flow chart, explain the fundamental structure of Lowry model. (08 Marks)  
 b. List the various assignment techniques and explain all or Nothing method. (08 Marks)

\*\*\*\*\*